A WWW INTERFACE FOR VIEWING AND SEARCHING SETS OF DIGITAL IMAGES

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As microscope images are increasingly being created and stored digitally, researchers are in need of tools to help them organize and quickly search these collections. Because of the large amount of storage taken up by digital images they are frequently kept on bulk storage systems remote from the microscopist's PC or workstation. The interface to these mass storage systems may be awkward and viewing large, remotely stored images can be very slow, making it difficult for the user to find a desired image.

The LBNL Image Library was designed and implemented to provide a system to help researchers organize, browse and search through digital image collections, especially collections where the original images are stored off-line in a mass storage system. We also wanted to facilitate co-operative research by allowing access to the images by specified users at local and remote sites.

An Image Library collection consists of thumbnail images and textual indexing material associated with pointers to the original images. This material is kept on-line on the machine that is running the Image Library Web Server. A user or project creates a top level collection on the server machine. Once the original beachhead is established, the collection owner is able to completely manage the collection from his local PC via Web form interfaces.

The Image Library provides the following functions:

1. Creates and stores a set of smaller "thumbnail" images that can be viewed quickly,
2. Keeps a text description file associated with each image and indexes over these files,
3. Allows the collection to be laid out in hierarchical sub-collections which can be independent of how the original images are organized or stored, and
4. Provides browsing tools to present a "view" of the thumbnail images selected by subcollection, search results, or individually by the user.

So far the Image Library has been used by two research projects. One contains about 900 scanning electron microscope images stored as 16bit grayscale TIFF images, and the other consists of about 20Gbits of X-ray video clips of coronary angiograms. In the first case, the software has enabled the researcher and his collaborators at remote sites to rapidly load and view images stored on the Lab's Unitree Mass Storage Server from desktop Macs. The second project is still in the testing stage, and is still being evaluated by the cardiologists. It has accomplished the main objective of allowing physicians at sites remote from the catherization laboratory to view the angiograms on their desktop computers.

The Image Library is implemented by a standard WWW server,[1] and a set of Perl scripts and HTML documents. A Web interface was chosen because it is graphical, platform and location independent and easily customized.[2]The server software was designed to be portable to most Unix systems and makes use of several portable libraries: pbmplus (Portable Bit Map) [3] and cjpeg for image transformations and Glimpse[4] for text indexing and searching. The client side of the application is slightly optimized for Netscape, but can generally be run by any graphic, forms-capable Web browser. Thus it runs on Unix, Windows or Mac platforms.

The Image Library can currently handle original images in 8bit or 16bit TIFF, GIF, JPEG and EPS formats. Adding images in a specialized microscope format typically requires the addition of a short script to convert the new format to a standard one. The thumbnail images are kept in either GIF or JPEG format.

To view a sample collection or to get information about downloading the software contact the URL http://www-itg.lbl.gov/ImgLib.

References

1. Robert McCool, et.al- http://hoohoo.ncsa.uiuc.edu/docs/Overview.html
2. Karen MacArthur - http://www.w3.org/hypertext/WWW
3. Jef Poskanzer - http://www.acme.com/software/pbmplus
4. Udi Manber, Sun Wu, Burra Gopal - http://glimpse.cs.arizona.edu:1994

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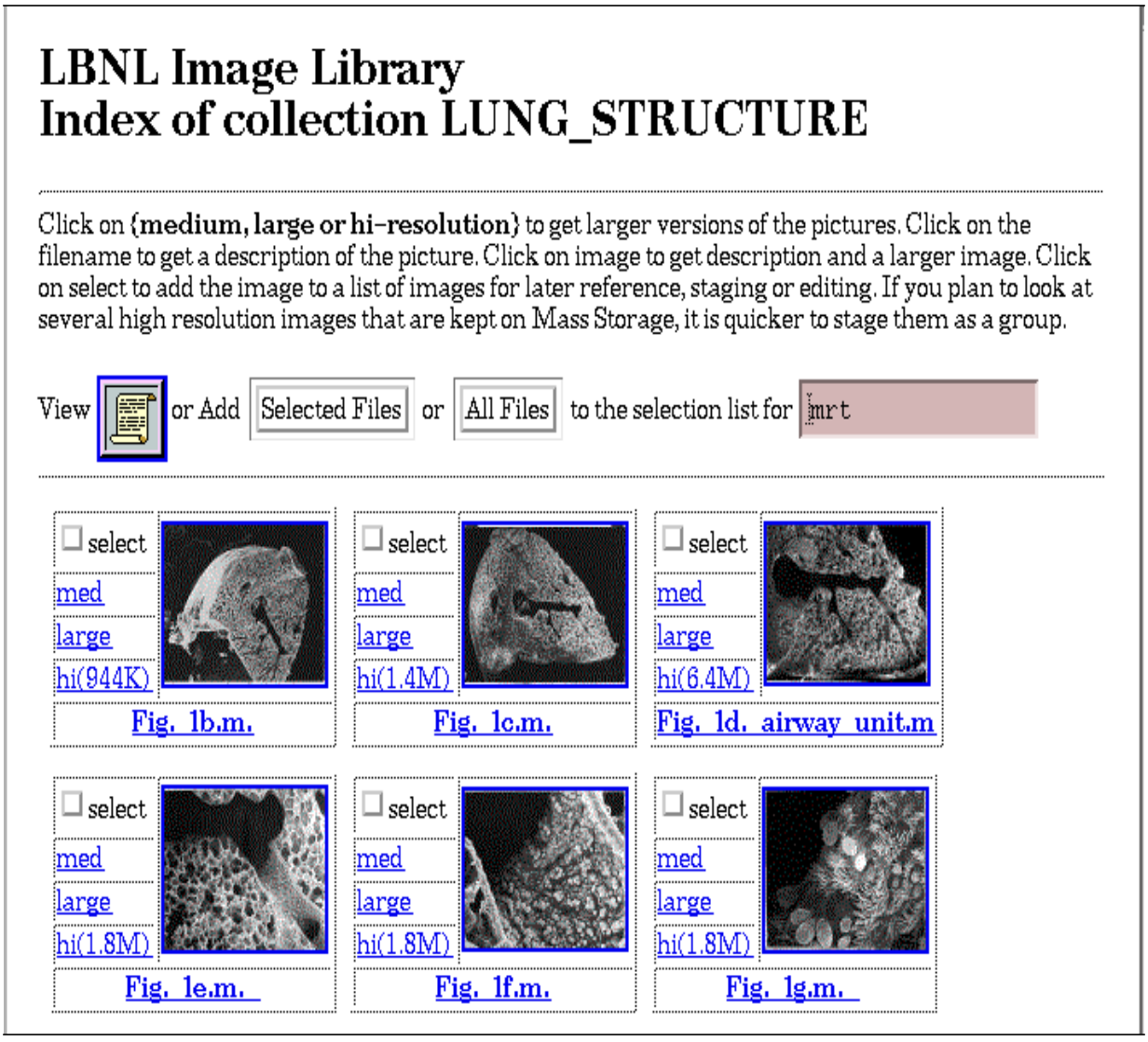

Fig. 1 Example of a browse page from the Image Library